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Immediate Water Pollution Control Needs White River Basin Missouri and Arkansas

Federal Water Pollution Control Administration, Dallas, Tex

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IMMEDIATE WATER POLLUTION CONTROL NEEDS

WHITE RIVER BASIN

MISSOURI AND ARKANSAS

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH CENTRAL REGION
DALLAS, TEXAS 75202

MARCH 1967

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16. ABSTRACT

The purpose of the report is to focus attention on known sources of pollution in this area and to provide a priority for action to correct existing problems and to prevent future problems.

17. KEY WORDS AND DOCUMENT ANALYSIS

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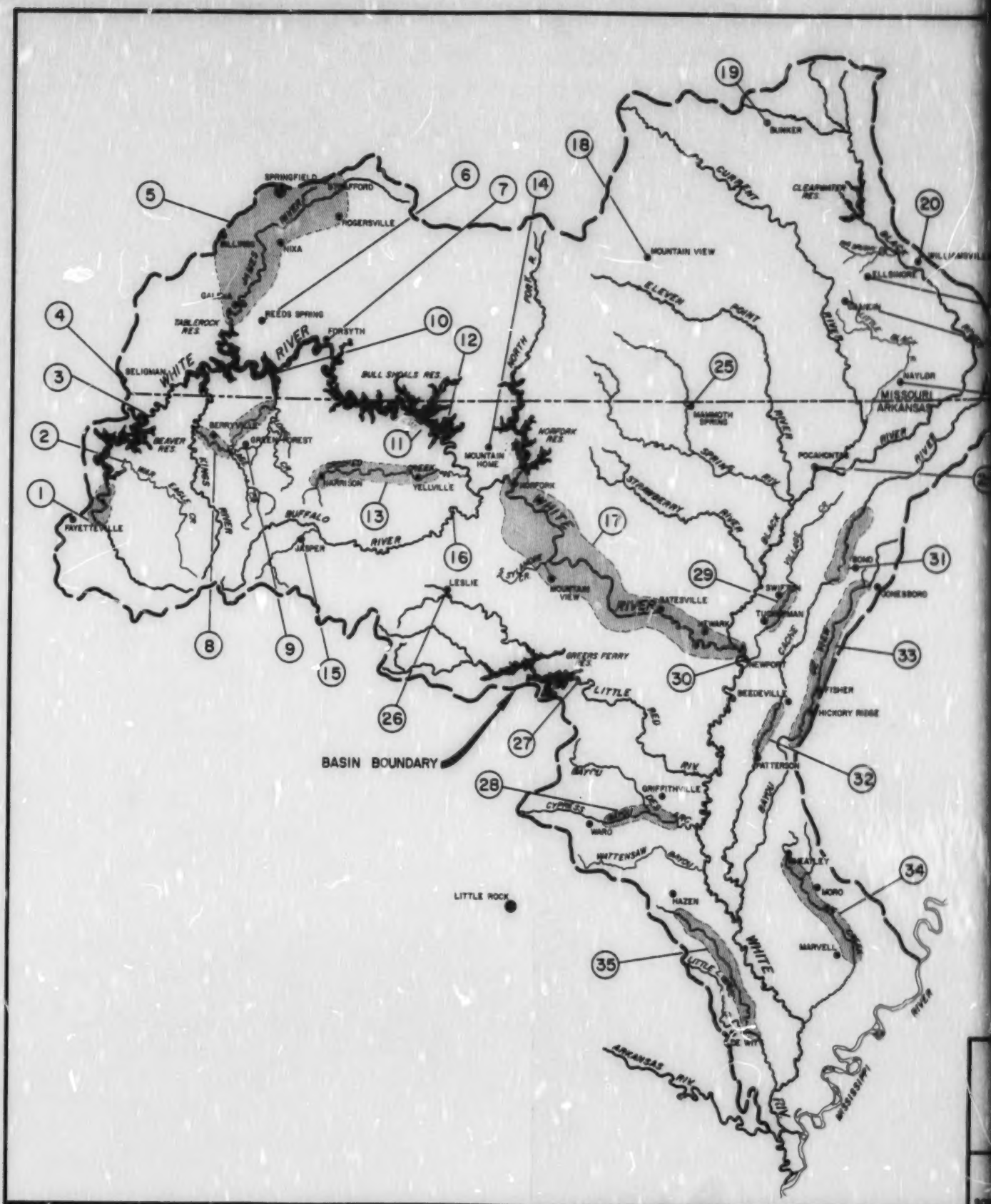
I. Introduction

The purpose of this report is to focus attention on known sources of pollution and to provide a priority for action to correct the existing water pollution problems and prevent future problems in the White River, (see Figure 1), an interstate stream and its tributaries. This report is based on compilations of available data of the Federal Water Pollution Control Administration, South Central Region, and the pollution control agencies of Arkansas and Missouri. No detailed water quality surveys or engineering studies were carried out for the preparation of this report.

The findings of this report are based on the best information available at this time on water quality conditions and immediate and potential pollution abatement needs. The omission of any particular town, industry, or other establishment from this report does not imply that an immediate or potential pollution abatement need may not possibly exist in that particular area. Priorities listed are based solely on an evaluation of the White River Basin and not on a relative basis with other basins in the South Central Region.

Authority is given in Section 3 (a) of the Federal Water Pollution Control Act, as amended, for the preparation or development of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof and improving the sanitary conditions of surface and underground waters. This report, by describing the immediate needs for controlling water pollution in the White River Basin, represents the first step in the development of a comprehensive program to control water pollution in this basin.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BULL SHOALS RES.
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BEAVER RES.
FAYETTEVILLE
HARRISON
YELLVILLE
MOUNTAIN HOME
NORFORK RES.
NORFORK
MOUNTAIN VIEW
LESLIE
JASPER
BUFFALO RIVER
WHITE RIVER
GREERS FERRY RES.
BATESVILLE
NEWARK
NEWPORT
SWIFTON
TUCKERMAN
JONESBORO
BEEDEVILLE
HICKORY RIDGE
PATTERSON
GRIFFITHVILLE
WARD
HAZEN
LITTLE ROCK
BEARDEN
MORO
MARVELL
BUNKER
CLEARWATER RES.
ELLSINORE
PIOCOMOKE
NAYLOR
MAMMOTH SPRING
POCAHONTAS
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ARKANSAS
BLACK RIVER
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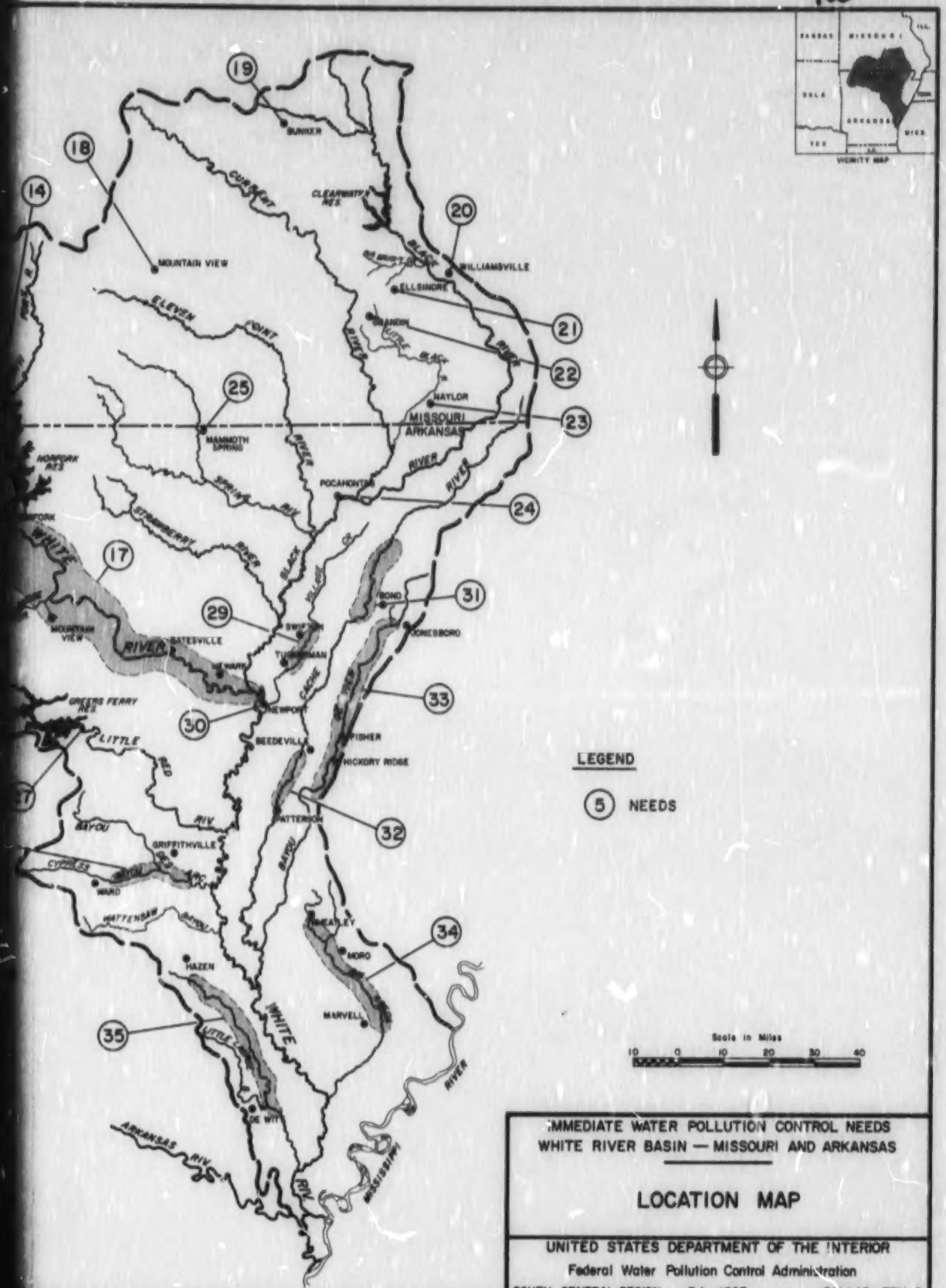

IMMEDIATE WATER POLLUTION CONTROL NEEDS
WHITE RIVER BASIN — MISSOURI AND ARKANSAS

LOCATION MAP

UNITED STATES DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
SOUTH CENTRAL REGION Feb 1967 DALLAS, TEXAS

FIGURE 1

II. Summary of Immediate Pollution Control Needs

Pollution problems in the White River basin, such as septic conditions, elevated water temperature, oxygen depletion, high nitrate concentrations, and degradation of esthetics, result in damages to propagation of fish life, municipal and industrial water supply, and recreation uses. The immediate pollution control needs are listed in the following tabulation and grouped into categories: waste treatment, flow regulation, other pollution control practices, institutional practices and research. Location designations refer to figure 1.

Waste Treatment

Location	Responsibility	Need	Priority
1	City of Fayetteville, Ark.	Primary & secondary treatment	A
2	State of Arkansas - Withrow Springs State Park	Primary & secondary treatment	B
3	Corps of Engineers - Beaver Dam & Powerhouse	Secondary treatment	B
4	City of Seligman, Mo.	Primary & secondary treatment	B
5	Cities of:		
	Billings, Mo.	Primary & secondary treatment	B
	Galena, Mo.	Primary & secondary treatment	B
	Nixa, Mo.	Primary & secondary treatment	B
	Rogersville, Mo.	Primary & secondary treatment	B
	Stratford, Mo.	Primary & secondary treatment	B
6	City of Reeds Springs, Mo.	Primary & secondary treatment	B
7	City of Forsyth, Mo.	Primary & secondary treatment	B
8	City of Berryville, Ark.	Expansion of secondary treatment	B
9	City of Green Forest, Ark.	Expansion of secondary treatment	B
10	Corps of Engineers - Table Rock Dam & Powerhouse	Secondary treatment	B

Waste Treatment (Continued)

Location	Responsibility	Need	Priority
11	State of Arkansas - Bull Shoals State Park	Primary & secondary treatment	B
12	Corps of Engineers - Bull Shoals Dams & Powerhouse	Secondary treatment	B
13	Cities of:		
	Harrison, Ark.	Expansion of secondary treatment	B
	Yellville, Ark.	Primary & secondary treatment	B
14	City of Mountain Home, Ark.	Expansion of secondary treatment	B
15	City of Jasper, Ark.	Primary & secondary treatment	B
16	State of Arkansas - Buffalo R. St. Park	Primary & secondary treatment	B
17	Cities of:		
	Batesville, Ark.	Primary & secondary treatment	B
	Mountain View, Ark.	Primary & secondary treatment	B
	Newark, Ark.	Primary & secondary treatment	B
	Norfolk, Ark.	Primary & secondary treatment	B
	Corps of Engineers - Norfolk Dam & Powerhouse	Secondary treatment	B
	U.S. Forest Service-Ozark National Forest	Expansion of secondary treatment	B
18	City of Mountain View, Mo.	Primary & secondary treatment	B
19	City of Tunker, Mo.	Primary & secondary treatment	B

Waste Treatment (Continued)

Location	Responsibility	Need	Priority
20	City of Williamsville, Mo.	Primary & secondary treatment	B
21	City of Elsinore, Mo.	Primary & secondary treatment	B
22	City of Grandin, Mo.	Primary & secondary treatment	B
23	City of Naylor, Mo.	Primary & secondary treatment	B
24	City of Pocohontas, Ark.	Primary & secondary treatment	B
25	City of Mammoth Spring, Ark.	Primary & secondary treatment	B
	State of Arkansas - Mammoth Spring State Park	Primary & secondary treatment	B
26	City of Leslie, Ark.	Primary & secondary treatment	B
27	Corps of Engineers - Greers Ferry Dam & Powerhouse	Secondary treatment	B
28	Cities of:		
	Griffithville, Ark.	Primary & secondary treatment	B
	Ward, Ark.	Primary & secondary treatment	B
29	Cities of:		
	Swifton, Ark.	Primary & secondary treatment	B
	Tuckerman, Ark.	Primary & secondary treatment	B
30	City of Newport, Ark.	Primary & secondary treatment	B
31	City of Bono, Ark.	Primary & secondary treatment	B
	State of Arkansas - Crowley's Ridge State Park	Primary & secondary treatment	B

Waste Treatment (Continued)

Location	Responsibility	Need	Priority
32	Cities of:		
	Beedeville, Ark.	Primary & secondary treatment	B
	Patterson, Ark.	Primary & secondary treatment	B
33	Cities of:		
	Fisher, Ark.	Primary & secondary treatment	B
	Hickory Ridge, Ark.	Primary & secondary treatment	B
	Jonesboro, Ark.	Expansion of secondary treatment	B
34	Cities of:		
	Marvell, Ark.	Primary & secondary treatment	B
	Moro, Ark.	Primary & secondary treatment	B
	Wheatley, Ark.	Primary & secondary treatment	B
35	Cities of:		
	De Witt, Ark.	Primary & secondary treatment	B
	Hazen, Ark.	Expansion of secondary treatment	B
Flow Regulation			
1	Soil Conservation Service	White River - storage to provide an average supplemental flow of 8 cfs for quality control below Fayetteville, Ark.	B
5	Corps of Engineers	James River - storage to provide an average supplemental flow of 9 cfs for quality control and low flow augmentation below Springfield, Mo.	A
17	Corps of Engineers	White River - low-flow releases during summer and fall months from Norfork or Bull Shoals Reservoirs to maintain flow in river and sustain water temperature below 68°F.	A

Other Pollution Control Practices

Location	Responsibility	Need	Priority
4	Greene County, Mo. - local interests	Paving of dairy feedlots and construction of concrete lagoons	A
31-34	State of Arkansas	Prevention of stream pollution from insecticide spraying by agricultural interests in Cache River Basin	B

Institutional Practices

Basinwide	States of Arkansas and Missouri	Prepare and adopt standards on intrastate streams	B
Basinwide	States of Arkansas and Missouri	Consider legislation to provide appropriations for state participation in grants for construction of sewage treatment works.	B
Basinwide	States of Arkansas and Missouri	Consider expansion of water quality control surveillance program (including treatment plant operation & maintenance)	A
Basinwide	States of Arkansas and Missouri	Prepare and maintain a complete industrial waste discharge inventory for industries not connected with municipal treatment systems.	B
Basinwide	States of Arkansas and Missouri	Consider legislation establishing controls on use of pesticides and herbicides.	B
Basinwide	FWPCA And USDA	Establish an educational program for the prevention of stream pollution resulting from the use of pesticides and herbicides.	B

Research

Location	Responsibility	Need	Priority
5	Geological Survey & Greene County, Mo.	Continued investigation of nitrate concentration increase	A
	FWPCA & State of Missouri	Investigation and study of pollution in James River	A
35	FWPCA & State of Arkansas	Determine effects on water quality from large-scale fish farming planned for this area.	B
Basinwide	Pesticide Producers & USDA	Develop pesticides and herbicides which are toxic to specific organisms but have little or no effect on aquatic life.	B

III. Immediate Control Needs

Various measures are needed to control existing and potential water pollution of the White River and its tributaries. These measures are needed to abate septic conditions, control stream temperature, increase oxygen content, reduce concentrations of toxic materials and nitrates for the protection of water uses within the basin. These include municipal and industrial water supply, propagation of fish and wildlife, recreation and irrigation.

The actions recommended here though not all encompassing are, however, prerequisite to good water quality planning and should be included in local, State, and Federal programming for water pollution control. Background for these immediate needs is summarized in Chapter VI.

Waste Treatment

Enlarged waste treatment facilities for the City of Fayetteville, Arkansas, are needed immediately to serve a design population of 100,000. Implementation of this project should carry a high priority.

New or expanded treatment facilities are needed by at least 43 other communities, 5 Corps of Engineers reservoir projects, one national forest (U. S. Forest Service), and 5 state parks (as listed in the summary table). The list of needs is not considered all inclusive and does not reflect projected needs due to future obsolesence or to expanded or changed water uses.

Flow Regulation

Short term projections indicate that within the next five years reservoir storage in the watershed of the White River above Fayetteville will be needed to supplement low flows in the stream and increase the streams' waste assimilative capacity. An average annual supplemental flow of 8 cfs will be needed and could best be provided from storage in one of the Soil Conservation Service's reservoirs currently being planned for this area.

An average annual supplement flow of 9 cfs is needed in the James River to abate pollution in the lower reaches and enhance low-flows in the stream. Storage could best be provided in a Corps of Engineers multiple-purpose reservoir project on the James River, currently in the planning stage.

Maintenance of higher low flows in the White River downstream from Bull Shoals and Norfork Reservoirs is needed to sustain a high quality trout fishing area. Reallocation of a small portion of the combined 3,092,000 acre-feet of flood control storage or 4,299,000 acre-feet of power drawdown and dead storage in the reservoirs is needed for water quality control and low-flow augmentation.

Other Pollution Control Practices

Paving of dairy feedlots and construction of concrete lagoons for the feedlots in the Springfield, Missouri area are needed as the initial step for abatement of pollution of groundwater and streams.

Increased surveillance and enforcement action by the State of Arkansas are needed to prevent stream pollution from insecticide spraying by agricultural interests in the Cache River basin.

Institutional Practices

To strengthen the states' position on prevention, control and abatement of stream pollution, water quality standards are needed on intrastate streams. State participation is needed in the waste treatment plant construction grants program to accelerate the construction of needed improvements. Increased surveillance and operation inspection of sewage and industrial waste treatment plants are needed to locate and identify existing or potential serious pollution problems. For more rigid control over industrial pollution and aid in solving complex stream quality problems, a complete and up-to-date inventory is needed of industrial waste discharges to basin streams, listing quantity and quality of effluent and other pertinent data.

Legislation with enforcement provisions is needed in the states of Arkansas and Missouri to establish control on use of pesticides and herbicides. There is also a need for educational programs by the Department of Agriculture and the Federal Water Pollution Control Administration to instruct prospective commercial applicators on the proper use of insecticides.

Research

Continued investigation and study by the U. S. Geological Survey and Greene County, Missouri, are needed to ascertain the cause and possible solution for the problem of increased nitrate concentration in springflow, groundwater and surface water in the Springfield area.

Research by Federal Water Pollution Control Administration and the State of Missouri is needed to determine the cause of heavy fish kills in the James River below the mouth of Wilson Creek.

Further research by the Department of Agriculture and agricultural chemical producers is needed to develop insecticides that are effective in eliminating insects but non-toxic to aquatic life.

A study by Federal Water Pollution Control Administration and the State of Arkansas is needed to determine the potential effect on stream quality of large scale fish-farming activities planned for the lower basin.

IV. Costs

The estimated cost of pollution control measures listed in the summary table is shown in the following tabulation:

Item	Estimated Cost
Municipalities:	
New treatment facilities	$ 5,100,000
Expansion of treatment facilities	3,900,000
Sub Total	$ 9,000,000
State Parks:	
New treatment facilities	$ 500,000
National Forest:	
Addition of secondary treatment facilities	$ 200,000
Federal Reservoirs:	
Addition of secondary treatment facilities	$ 50,000
Storage in SCS Reservoir - Upper White River	500,000
Storage in Corps of Engineers Res. - James River	450,000
Reallocation of storage in Bull Shoals Reservoir (Corps of Engineers) - White River	*
Sub Total	$ 1,000,000
Agricultural Areas:	
Dairy Feedlot Water Pollution Control	$ 200,000
TOTAL	$10,900,000

* Public Law

Of the total cost, approximately $4,300,000, exclusive of research costs, would be needed for control measures listed under priority "A" in the summary table.

V. Recent Progress in Pollution Control

Federal Construction Grants Program

Through a continuing construction grants program, treatment facilities and appurtenant works have been constructed at 42 towns and cities in the basin. These have been completed since 1958. Under this program four additional projects in Arkansas are under construction and grant offers have been made for facilities at three other cities.

State Agencies

The Arkansas Pollution Control Commission and the Missouri Water Pollution Board, in cooperation with the State health departments, water conservation commissions, and other State departments and municipalities, have made significant strides in recent years to control water pollution in the basin through surveillance, construction of treatment facilities, training programs, and periodic inspection of treatment plant operation. Agreements have been made between the two states on operation of a 25-station monitoring network on interstate streams. Regional training schools for waste treatment plant operators are being established by the Missouri Water Pollution Board.

White River Basin Comprehensive Study

A comprehensive basin study under the auspices of the Water Resources Council is currently being prepared on the White River basin. The report is under the direction of a coordinating committee composed of representatives of the States of Arkansas and Missouri, the Federal Power Commission, and the U. S. Departments of Agriculture, Army, Commerce, Interior, and Health, Education, and Welfare. The Federal Water Pollution Control Administration is represented on a number of planning committees and work groups, and has been responsible for determination of needs for water supply and water quality control storage in reservoir projects and for assisting in formulation of plans to meet these needs. Planning is in progress to meet many of the potential pollution control needs.

Lower Mississippi River Comprehensive Water Pollution Control Program

The Federal Water Pollution Control Administration has initiated a comprehensive water pollution control program in the lower Mississippi River basin. The White River basin is included in the program area.

VI. Background

Pertinent Basin Characteristics

The White River basin, as shown in figure1, lies in the States of Arkansas and Missouri and drains an area of 27,765 square miles, of which 17,145 square miles are in the State of Arkansas, and 10,620 square miles are in Missouri. Approximately 75 percent of the basin is located in the Ozark Plateau, characterized by rugged hills and spring-fed streams and rivers having rapid runoff, high flows and steep slopes. The remainder of the basin lies in the Coastal Plain, where stream channels and flood plains are wide and flat, runoff is sluggish and channel slopes are less than one foot per mile. The Ozark escarpment, which separates the plateau country from the plains stretches generally southwestward across the basin between the Black and Cache River basins from near Poplar Bluff, Missouri crosses the White River near Batesville, Arkansas and extends to near Cabot, Arkansas on the basin divide.

The White River basin is endowed with large quantities of streamflow. The average annual runoff ranges from 12 to 24 inches. Based on long-term averages, the flow of the White River increases from about 1 million acre-feet per year near Fayetteville, Arkansas, to over 22 million acre-feet per year near its mouth. At the junction of the White River and the Black River at Newport, Arkansas, the flow has averaged about 16 million acre-feet per year, with about 9 million acre-feet from the White River and the remaining 7 million from the Black River and its tributaries. High sustained flows of the river, even during severe drought, come from numerous large springs in the Springfield-Salem Plateaus on the Interior Highland above Newport having average flows as great as 428 cubic feet per second.

A 265 mile reach of the White River beginning at a point near Fayetteville, Arkansas and continuing downstream is now a series of lakes formed by four dams, Beaver, Table Rock, Ozark Beach (Taneycomo), and Bull Shoals. Beaver, Table Rock, and Bull Shoals Reservoirs on the White River, and Norfork, Greers Ferry, and Clearwater Reservoirs on tributary streams are Federal projects constructed for flood control, hydroelectric power, water supply, and recreation purposes.

The White River basin has a total population of less than 800,000 and a population density of about 29 per square mile. Fayetteville, Arkansas (23,000) and Springfield, Missouri (72,000 in basin) are the largest cities in the basin.

Water Quality

The chemical quality of the surface waters of the White River basin is excellent and all chemical constituents are well within the Public Health Service Drinking Water Standards. In most areas of the basin the surface waters are virtually free from natural chemical and organic pollutants. There are no natural salts, no oilfield brines, and no known sediment problems. There is no oil and gas industry in the basin. The following tabulation, in general reflects this high quality.

		Dissolved Solids* (mg/1)			Chlorides (mg/1)		
	Samples	Max.	Min.	Avg.	Max.	Min.	Avg.
White River at Newport, Ark.	111	388	98	165	123	0.5	5.0
White River at Clarendon, Ark.	119	282	38	145	58	2.0	5.8

		Sulfates (mg/1)			Nitrates (mg/1)		
		Max.	Min.	Avg.	Max.	Min.	Avg.
White River at Newport, Ark.	111	14	2.0	6.2	5.1	0.3	2.2
White River at Clarendon, Ark.	119	23	1.0	4.5	7.8	0.1	1.8

* Residue after evaporation at 180°C.

Source: Arkansas State Board of Health and U. S. Geological Survey.

The quality of ground water in the basin is satisfactory for most purposes. However, some treatment for municipal and industrial uses is required in certain specific areas, to remove excessive hardness.

A number of springfed rivers and streams of the White River Basin are very high quality trout streams and constitute a part of the proposed national system of wild rivers and scenic riverways. The rivers are extensively used for float-fishing and other recreational purposes, fisheries for trout and other game fish, irrigation and fish farming, for generation of hydroelectric power, and municipal and industrial water supply purposes. In some isolated areas, water quality problems have periodically damaged water use.

Present Water Quality Problems

Pollution of streams in the White River Basin at the present time is not a severe problem because of the comparatively small population, few industries, and the high sustained flow of the White River and its major tributaries on which most of the larger communities are located. Waste discharges to streams of the basin total about 30 million gallons per day from 62 municipal systems, 44 of which are in the State of Arkansas. Most heavy water-using industries that would pose a potential pollution problem are located within the corporate limits of cities within the basin and discharge their wastes through the municipal systems. Principal among these industries is the food and kindred products industry, engaged largely in the processing of poultry, dairy, and beef products. Some pollution problems, however, do exist and result from inadequate or overloaded existing municipal treatment facilities, inadequate streamflow during summer months in certain areas, dairy feedlot operations, dumping of raw wastes into streams by industries, and agricultural spraying of pesticides and herbicides.

White River Upstream From Beaver Reservoir

Municipal and industrial waste discharges from the city of Fayetteville, Arkansas are causing oxygen depletion in the White River upstream from the headwaters of Beaver Reservoir, a Federal project constructed by the Corps of Engineers for municipal and industrial water supply, hydroelectric power, and recreation. Fish kills and septic conditions have occurred in the river and in the headwaters of the reservoir. The city's waste treatment plant has secondary facilities, designed to serve a population of about 20,000, which are now grossly overloaded. Among those served by the city's waste treatment plant are the University of Arkansas, a large veterans (Federal) hospital, and several food industries. The largest of the food industries is the Campbell Soup Company which processes about 55,000 chickens per day.

James River Below Springfield Missouri

The city of Springfield, Missouri discharges its wastes after secondary treatment to Wilson Creek, a tributary of the James River. Heavy fish kills have occurred in the James River below the mouth of Wilson Creek during summer months following local heavy thunderstorms in the Wilson Creek watershed. These fish kills are believed to be caused by one or more of the following conditions:

1. Rapid temperature change in the receiving stream.

2. Strength, volume or timing of storm runoff or sewage bypass.

3. Possible entrance of slug volume of storm water into the underground channel system of Wilson Creek, pushing ahead and returning to the surface downstream, ahead of surface flow, a slug volume of the accumulated oxygen deficient waters.

4. Possible accumulation in underground channels and flushing by storm water of waste, dead algae, organisms and organic solids.

Reports indicate the secondary treatment plant of the city of Springfield is modern, well-operated and has ample capacity. However, during periods of low flow in the James River, waste discharges from the Springfield area exceed the assimilative capacity of the stream. The Missouri Water Resources Board, in a statement at a public hearing on water quality standards, indicated that the lower reaches of the James River are not capable of assimilating this waste in a manner that will maintain water quality suitable for optimum fishery.

Greene County, Missouri

In recent years there has occurred a significant increase in concentration of nitrates in springflow and ground water, in the Springfield area rendering some sources unsuitable for certain water supply purposes. Concentrations of nitrates are also increasing in surface waters. Stream samples taken by the Geological Survey indicated an increase of nitrate concentration (NO_3) in one stream from about 2.8 mg/l to about 24 mg/l during a four-month period in 1965. Investigations and study of this problem are being conducted by the U. S. Geological Survey, Rolla, Missouri in cooperation with Greene County. As presently known, the specific condition causing the problem has not been definitely isolated. Limestone soils and porous Karst topography in the Springfield area, containing sink holes and solution channels, in many cases, cause surface water runoff to be carried long distances underground before reappearing as springflow or in wells.

Extensive dairy feedlot operations in the Springfield area have been suggested as a possible cause. There are approximately 10,000 dairy cattle in this area.

White River Downstream From Bull Shoals Reservoir

Elevated temperatures in the White River caused by interrupted flows downstream from the Bull Shoals and Norfork hydroelectric power projects have resulted in extensive fish kills. The fish kills occur each year during summer months in a 20-mile reach downstream from the reservoirs when water temperatures rise above 68°F and are particularly noticeable on the three-day holiday weekends of July 4 and Labor Day. The 100-mile reach of the White River downstream from

Bull Shoals Reservoir is an extremely high quality trout stream and contributes significantly to the $6,000,000 a year trout fishing business in Arkansas.

Use of Agricultural Chemicals

The use of herbicides and pesticides for insect control on cotton acreage has polluted streams and resulted in fish kills within the State of Arkansas. These agricultural areas are largely concentrated in the Cache River basin, tributary to the White River, where some 500,000 acres of cotton are grown.

Other Areas

Throughout the White River basin there are many small problems of water pollution in streams receiving waste discharges from communities having inadequate treatment facilities. The communities are tabulated in the summary table and are shown on figure 1.

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